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Phytoscreening of BTEX and chlorinated solvents by tree coring

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Tree coring

Phytoscreening by **tree coring** is a low-cost and easy method, for screening of shallow pollution over large areas. It can be used to focus other more advanced and cost-intensive screening methods, to make site characterization more efficient.

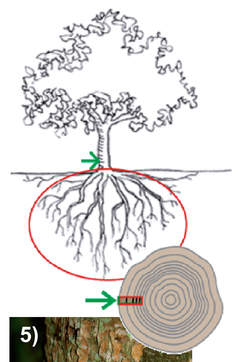
Subsurface pollutants are **taken up by the root system and transferred to the wood**. Cores from the stem are sampled by a hand drill and analyzed. The extend and level of the **contamination is mapped**. The method has shown to be well suited for chlorinated solvents, but the current application at BTEX contaminated sites is limited.

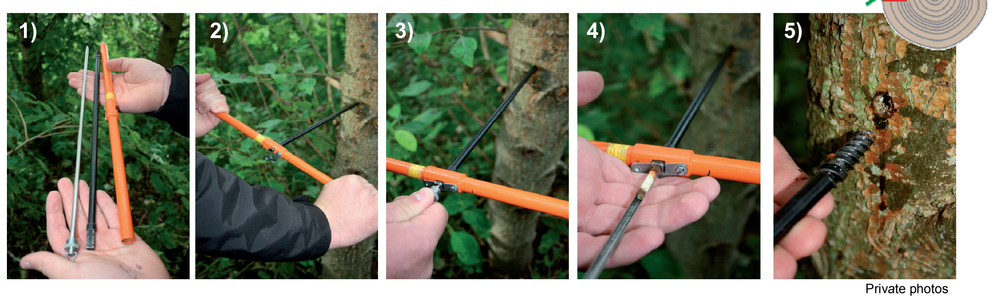
The purpose of this study was:

- To test the feasibility of the method as a BTEX screening tool.
- To compare tree coring as an initial screening method with soil gas sampling.

Sampling procedure

1) The Suuntu borer: Core extractor, borer and handle.
2) Screwing in the borer to the stem.
   Correct sampling point: 1 m height, 6 cm in depth.
3) Insertion of the core extractor.
4) Removing of tree core sample.
5) The tree after sampling.



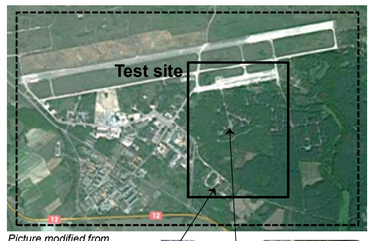


Private photos

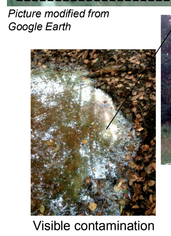
Benzene, Toluene, Ethylbenzene and Xylenes (BTEX)

Application:

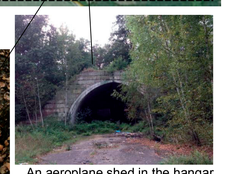
- ***Purpose:*** Test method feasibility.
- ***Test site:*** Former Air base in Szprotawa, Poland.
- ***Tree species:*** Pine, birch, willow and asp.
- ***Contamination level:***
  - High risk areas: 50-70 mg BTEX/kg.
  - Outside high risk areas: 2-2.3 mg BTEX/kg.
- ***Comparison sampling:*** Soil samples.



Picture modified from Google Earth



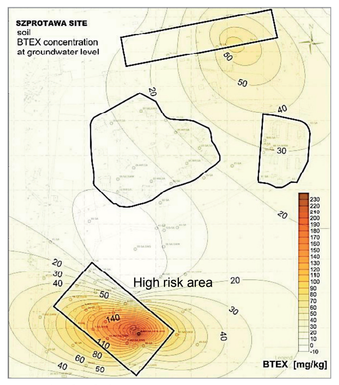
Visible contamination in the high risk area. *Private photo.*



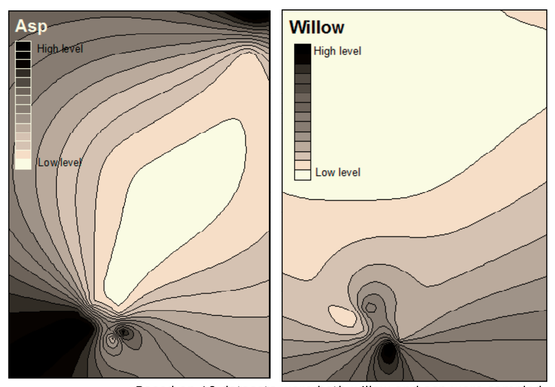
An aeroplane shed in the hangar area (medium polluted). *Private photo.*

Outcome:

- BTEX can be detected in the wood.
- The high risk area was located, however some discrepancies (including non-detected) occur when comparing with soil samples.
- The method depends on the tree species; *willow and asp are preferred, pine may be useful for toluene, birch is not recommended.*



Results for foil to comparison



Based on 10 datasets were both willow and asp were sampled

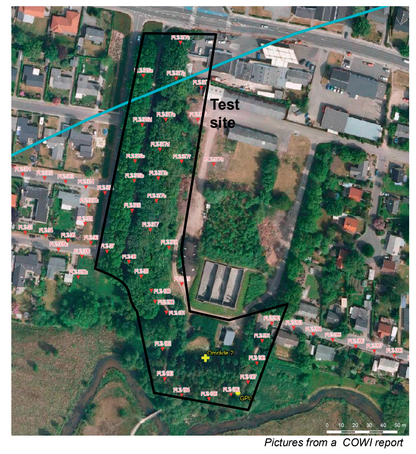
Conclusion:

- Tree coring willow and asp can be suitable as initially screening tool to locate high risk areas for BTEX.
- More investigations are needed.

Chlorinated solvent (PCE)

Application:

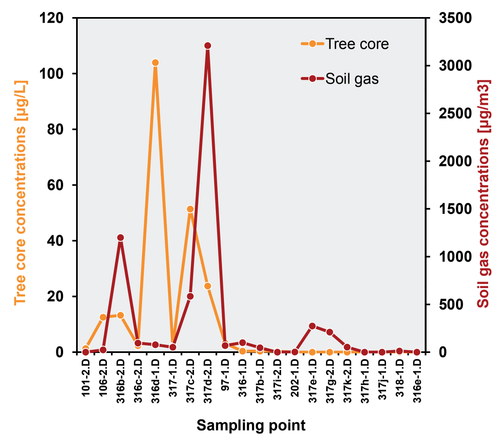
- ***Purpose:*** Method comparison of tree coring ans soil gas sampling.
- ***Test site:*** Former industrial production in Jutland Denmark.
- ***Tree species:*** Beech, oak, pine and others.
- ***Contamination level:*** 5-3210 µg PCE/m³.
- ***Comparison sampling:*** Soil gas sampling.

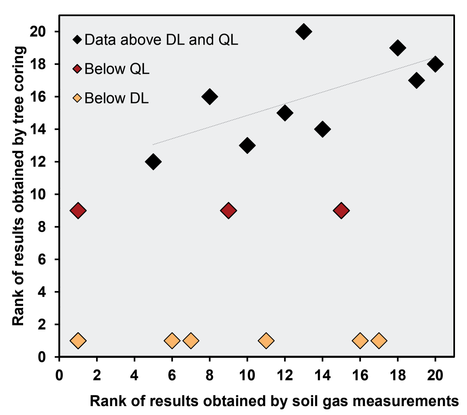


Pictures from a COWI report

Outcome:

- Chlorinated solvents can be detected in the wood and high risk area were located.
- Evaluation of data and comparison with other methods should be based on ranked data.
- A positive trend is observed between ranked soil gas and tree coring results.





Conclusion:

- Tree coring is well suited screening tool for locating of PCE (and TCE) contamination in the shallow subsurface and particularly to identify source/high risk areas.
- Good supplement to soil gas sampling.

QL: Quantifications limit, DL: Detection limit

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Literature: http://www.timbre-project.eu/
Additional sampling guideline and investigations report will be available at the homepage summer 2014.

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SEVENTH FRAMEWORK PROGRAMME

timbre